The increased use of xDSL-equipped loops also reflects the increasing importance of data telecommunications relative to voice. Internet traffic is growing at 1,000% a year and data traffic over the public switched network is doubling annually. 9/ By contrast, voice traffic is expanding at only single-digit rates. 10/ Data traffic already accounts for over half the total traffic of most U.S. carriers. One analyst estimates that by the year 2005, the volume of data traffic is expected to be 23 times the volume of voice traffic. 11/

xDSL electronics can help accommodate a large share of the data demand from small businesses and consumers without much additional investment in network infrastructure. It leverages investments that incumbent local exchange carriers ("ILECs") already have made (in twisted copper pair, Digital Loop Carrier electronics in the field, and fiber feeders in the local distribution plant), enabling the existing local exchange network to support higher-bandwidth telecommunications services to a far greater number of customers. xDSL thus can form the basis for the expansion of consumer choice into the broadband world -- but only if the ILECs' investments in xDSL remain subject to the local competition provisions of the Communications Act.

9/ "Lucent Agrees to Buy Yurie for $1 Billion" Wall Street Journal, April 28, 1998.

10/ Id.

11/ Id., quoting Christopher Stix of Cowen & Co.

B. xDSL is a Manifestation of the Natural Evolution of the Network to Higher Speeds and Greater Digital Capabilities.

xDSL is only the most recent manifestation of the natural evolution of the telephone network to increased digital capabilities and higher speed transmission. Over time, telecommunications networks have moved from analog to digital transmission, from in-band to out-of-band signaling (SS7), from copper to fiber optic facilities, from circuit-switched to packet-based transmission systems, and so on. xDSL technology is just another step in this natural progression.

xDSL also is just another example of the use of electronics in the network to boost the capabilities and the capacity of the existing infrastructure. For example, multiplexers deployed in the ILEC network can multiply by many factors the speed of traffic over the same copper or fiber-optic strand. ISDN technology deployed at either end of a copper loop (or at the remote digital loop carrier, in the case of DLC installations) can create digital capability, additional lines, and higher speed on that existing copper facility. xDSL is no different.

xDSL also does not require the use of radically new functionalities. Indeed, ILECs have used xDSL electronics for over five years to maximize the efficiency of their networks. For example, ILECs have used a version of xDSL known as HDSL to support high bandwidth (T-1) transport for both end users and carrier-customers. 12/ Those T-1 lines can be used by customers for both voice and

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12/ A channelized T-1 service is the equivalent of 24 64 kbps (voice-grade equivalent) channels and operates at 1.544 Mbps speeds.

data transmissions at high capacity. In a similar manner, placement of xDSL electronics in the local loop allows subscribers to place voice calls over the circuit-switched network and to access data networks simultaneously over a single line, and to obtain high speed access to data networks.

In sum, although the ILECs attempt to paint xDSL technology as somehow different (and thus off-limits to competitors), in fact xDSL is another in a long line of advances in network technology -- advances that are sure to continue, and sure to evolve in as-yet unanticipated ways.

II. IT IS ESSENTIAL TO PRESERVE THE THREE ENTRY STRATEGIES GUARANTEED BY CONGRESS AS THE INCUMBENT LEC NETWORK EVOLVES.

The Communications Act 13/ specifically makes available three entry strategies to CLECs that wish to provide competing local telecommunications services. First, a competitor may provide such services entirely over its own facilities. Congress recognized that even such facilities-based CLECs would require access to the ILEC networks in most cases and, therefore, required ILECs to provide nondiscriminatory interconnection to their networks. See 47 U.S.C. § 251(c)(2). Second, a CLEC may enter the market for local telecommunications services through the use of unbundled network elements (either all or some of the elements required to provide the service). See 47 U.S.C. § 251(c)(3). Finally,

13/ Communications Act of 1934, as amended, 47 U.S.C. § 151 et seq. (hereafter "the Act")

CLECs may resell retail local telecommunications services purchased from ILECs at wholesale rates. See 47 U.S.C. § 251(c)(4).

The Communications Act does not express any preference among these three service delivery methods. It provides flexibility to CLECs in order to encourage speedy and broad-based competition in all market segments and for all services. Congress recognized that facilities-based competition may not materialize everywhere, serve everyone, and provide competitive choices for all services and, therefore, provided CLECs with the right to employ the ILEC network infrastructure (as network elements) in order to hasten the arrival and reach of local competition.14/

Requiring CLECs in all cases to provide their own xDSL electronics and to collocate at central offices if they wish to provide xDSL services contradicts Congressional intent and the plain language of the Act by forcing CLECs to install equipment of their own as a precondition to provision of xDSL services. 15/ As the

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14 See, e.g., Joint Statement of Managers, S. Conf. Rep. No. 104-230, 104th Cong., 2d Sess. at 148 (1996) ("This Conference Agreement recognizes that it is unlikely that competitors will have a fully redundant network in place when they initially offer local service, because the investment necessary is so significant. Some facilities and capabilities (e.g., central office switching) will need to be obtained from the incumbent local exchange carrier as network elements pursuant to new Section 251").

15/ Any facilities requirement, whether physical collocation, virtual collocation, cageless collocation, or otherwise, will have the same chilling effect on competitive deployment of broadband telecommunications services, because each of these methods requires having a physical presence in the central office -- with its associated up-front costs, economies of scale, and installation/maintenance/remote testing issues. These methods would also require huge investment in interoffice

Eighth Circuit Court of Appeals has made clear, a carrier need not own any of its own facilities in order to provide telecommunications services over network elements purchased from the ILEC. 16/ Such a facilities requirement would also have the effect of restricting and discouraging broadscale deployment of xDSL services by CLECs. It would mean, as a practical matter, that CLECs can profitably supply xDSL services only to customers concentrated in dense commercial areas or served by central offices with a large number of potential customers. 17/

The Act allows neither regulators nor ILECs to decide when and where it is cost-effective to construct facilities in lieu of the CLEC being given access to unbundled network elements. Congress left that choice to the CLEC. Moreover, as the FCC concluded, requiring facilities investment as a condition to competing in the local market would inhibit the development of local competition. The Commission specifically rejected the argument that forcing requesting carriers to own some of their own facilities would somehow spur local exchange competition. Instead, the FCC concluded that "such a result could *diminish* competition, and that allowing new entrants to take full advantage of incumbent LECs' *scale and*

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dedicated transport and packet switching, unless these capabilities can be obtained as network elements, including the availability of shared transport.

16/ Iowa Utilities Board v. FCC, 120 F.3d 753, 814 (8th Cir. 1997), cert. granted, 118 S. Ct. 879 (1998).

17/ We discuss in Section IV below why competitors cannot economically provide their own xDSL electronics and interoffice facilities on a broad basis.

scope economies will promote more rapid and efficient entry and will result in more robust competition." 18/

III. THERE IS NO LEGAL BASIS FOR FENCING OFF XDSL TECHNOLOGY.

A. The BOCs Improperly Rely on Section 706 to Shield Them From Their Statutory Obligations.

Several RBOCs have asked the FCC to forbear from requiring them to make available to their competitors the advanced capabilities of their incumbent local exchange networks. These large ILECs would like the FCC to allow them to escape their statutory obligations to make their advanced network capabilities available to competitors as "network elements" pursuant to Section 251(c)(3) of the Communications Act and to resell their advanced retail services at wholesale rates under Section 251(c)(4) of the Act. 19/

In seeking *forbearance,* these RBOCs implicitly acknowledge these statutory obligations. They also appear to recognize that the Act's forbearance provision (Section 10) does not permit the FCC even to consider forbearing from

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18/ In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, CC Docket No. 96-98, First Report and Order, 11 FCC Rcd 15499 (1996), aff'd in part and rev'd in part, Iowa Utilities Board v. FCC, 120 F.3d 753 (8th Cir.), cert. granted, 118 S. Ct. 879 (1998) ("Local Competition Order") at para. 340 (emphasis added).

19/ As discussed in note 2, above, this paper does not address the other RBOC forbearance requests.

Section 251(c) requirements until that section is "fully implemented." 20/ The RBOCs seek forbearance not under that general statutory forbearance provision, but instead under Section 706 of the Telecommunications Act, 47 U.S.C. § 157(note). 21/ However, Section 706 is a broad instruction to both the FCC and the state commissions to use whatever authority they have to promote advanced technology deployment; it does not constitute an independent grant of authority to either the FCC or the states.

The RBOC petitions also ignore the fact that Section 706 itself contemplates that the FCC will use the promotion of local competition as a means for encouraging the deployment of advanced technology. The RBOCs' petitions would have the FCC do the polar opposite: allow them to *impede* local competition as a means to advance the deployment of advanced technology. This is clearly not what Congress had in mind.

The FCC will be conducting the required inquiry under Section 706 later this summer, and will doubtless explore many proposals to promote

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20/ 47 U.S.C. § 160 Sections 10 and 332(c) contain the only generic forbearance authority in the Communications Act. See 47 U.S.C. § 160, 332(c). Section 10(d) contains the "fully implemented" restriction, and Section 332(c) only applies to commercial mobile radio (*i.e.* wireless) services.

21/ Section 706 requires the FCC and each state commission to take steps to promote "reasonable and timely" advanced technology deployment "by utilizing, in a manner consistent with the public interest, convenience, and necessity, price cap regulation, regulatory forbearance, measures that promote competition in the local telecommunications market, or other regulating methods that remove barriers to infrastructure investment." 47 U.S.C. § 157(note).

deployment of advanced technology. LCI enthusiastically supports the goals of Section 706. The point of this white paper, in fact, is to show that the goals of Section 706 will be best achieved if advances in the ILEC network are available to all competitors, and not only to the incumbent LEC. It should go without saying that if the ILEC can relegate competitors to using only the old capabilities of the network, while reserving to themselves the new capabilities, that consumers will not reap the benefits of competition as technology advances, but rather will revert to having only one choice -- the monopoly local exchange carrier.

B. The Act Does Not Limit Competitors' Access to ILEC Network Capabilities.

While the RBOC petitions do not contest their obligations to make xDSL technology available to competitors under Sections 251(c)(3) and 251(c)(4), we nevertheless discuss in this section the legal underpinnings of the right of competitors to access the ILECs' xDSL capabilities without owning or installing their own facilities.

The efforts of incumbent LECs to limit CLEC access to specific equipment or capabilities in the ILEC network is flatly contrary to the Act. Section 3 of the Act defines "network element" broadly to include all "features, functions, and capabilities" of a "facility or equipment used in the provision of a telecommunications service." 47 U.S.C. § 153(29). xDSL functionality falls squarely within this definition. Nothing in the definition of network element or the Section 251(c) unbundling provisions would suggest that the availability of the "features, functions, and capabilities" of ILEC network facilities or equipment is limited to voice services or to circuit-switching technology. The plain language of Section 251(c)(4) also requires the ILEC to permit CLECs to resell ILEC xDSL-based retail services at wholesale rates. 47 U.S.C. § 251(c)(4).

Indeed, the FCC underscored the importance of giving CLECs access to the network as the technology evolves. The FCC's Local Competition Order provides that the unbundling rules "must accommodate changes in technology." 22/ In a dynamic industry like telecommunications, competitors would be at a severe competitive disadvantage if they could not employ new capabilities of the ILEC network as it evolves. The Eighth Circuit also recognized that giving competitors broad access to ILEC network elements would on balance spur more innovation that denying such access: "the pro-competitive effects of unbundling... could spur enough innovation to offset any potential reduction in innovation that the unbundling standard might cause." 23/

Requiring CLECs to install their own DSLAM equipment or their own packet switching and transport facilities in order to be able to compete in the provision of broadband telecommunications services also would violate the Act. Requesting carriers have the right to purchase and combine all the network elements required to provide service, without owning any of their own facilities. 24/

22/ Local Competition Order at para. 259

23/ Iowa Utilities Board v. FCC, 120 F.3d 753 at 811.

24/ Local Competition Order at paras. 328-40.

The Eighth Circuit affirmed the FCC on this point, holding that "a competing carrier may obtain the ability to provide telecommunications services *entirely through* an incumbent LEC's unbundled network elements..." 25/

Whether a requesting carrier is able to duplicate any particular network element or capability is irrelevant to that carrier's right to obtain it, instead, from the ILEC. On the contrary, the FCC found in its August 1996 Local Competition Order that "[r]equiring new entrants to duplicate unnecessarily even a part of the incumbent's network could generate delay and higher costs for new entrants...," and specifically did not adopt a suggested requirement that ILECs need not supply advanced network elements if the competitor could obtain those elements elsewhere. 26/

In sum, there is no legal basis for denying requesting carriers access to xDSL-equipped loops, packet switching, and interoffice transport as network elements.

C. xDSL Electronics are an Integral Part of the Subscriber Loop.

An "xDSL-equipped" loop, like any other loop, is a network element within the meaning of Section 251(c)(3) of the Communications Act. 27/ xDSL-equipped loops fall squarely within the statutory definition of a "network element,"

25/ Iowa Utilities Board v. FCC, 120 F.3d at 814 (emphasis added).

26/ Local Competition Order at para. 283.

27/ 47 U.S.C. § 251(c)(3).

which includes all the "features, functions, and capabilities" of any ILEC "facility or equipment used in the provision of a telecommunications service." 47 U.S.C. § 153(29).

It is conceptually erroneous to define a local loop solely by reference to the physical pair of copper wires that runs from the customer's premises to the central office. The electronics necessary to transmit signals over that wire are an integral part of the loop and are included in what a carrier is entitled to purchase as a network element. 28/ Electronics may alter the transmission characteristics of a local loop (such as capacity or format), but they are part of the local loop.

Digital Loop Carrier (DLC) technology provides a case in point on why a local loop cannot be defined solely as a pair of copper wires. ILECs are turning to DLCs (also commonly called "remote terminals") because they have discovered that it is more cost-efficient to aggregate traffic at remote sites rather than build new, dedicated copper links all the way from the customers' premises to central offices ("home run copper"). Approximately 20-30 percent of customers nationwide are currently being served using DLCs, and more DLCs are being deployed by ILECs every month. 29/

28/ The FCC has defined the local loop as "a *transmission facility* between a distribution frame, *or its equivalent*, in an incumbent LEC central office, and the network interface device at the customer premises." Local Competition Order at para. 380. (emphasis added).

29/ See Arielle Emmet, "Multimedia: Making it Pay," America's Network, May 1, 1997 (estimating 20 percent DLC lines); "xDSL: Local Loop Access Technology," WWW3COM.COM (estimating 30 percent DLC lines). The percentage of lines served by DLCs (now between 20-30 percent nationwide) rises dramatically when

When an ILEC employs a remote DLC, there is no discrete pair of copper wires that runs all the way from the customer's premises to the central office. 30/ In most cases, ILECs transport the traffic that is concentrated at the DLCs in digital format via a high-bandwidth transmission link (generally fiber optic cable), which feeds directly into the ILEC switch. Various facilities and equipment are associated with the customer's local loop in a remote DLC environment. They include the copper wire from the customer's premises to the DLC, the line card at the DLC, the electronics at the DLC that convert analog signals to digital format, the electronics that concentrate the traffic, the electronics

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one focuses on rural and suburban residential and business customers. It will also continue to increase for all customers as the demand for bandwidth rises, as the demand for second lines grows, and as the embedded copper plant becomes obsolete and uneconomical to replace with more "home-run" copper lines. ILECs increasingly are deploying DLCs (both copper T-1 and fiber-fed) to serve both existing customers (who previously were served by home-run copper) and new customers. They also are using DLCs in preparation for xDSL because shorter copper pair run lengths to the customer allow for higher speed and better quality xDSL services. See Appendices A and D for more detailed information about the use of DLCs.

30/ The same is true for T-1 circuits and ISDN lines. An ISDN basic rate local loop requires ISDN line cards at either the switch or the digital loop carrier, as well as an ISDN modem at the customer premises. T-1 loops have evolved over time. Originally, T-1 capabilities could only be served on special copper cable. Later, fiber-optic electronics and medium were inserted either in the middle or terminal points of a T-1 system as that technology became available. Currently, HDSL electronics and traditional twisted copper cable are being used to provide T-1 services. As a result of this evolution, it is entirely possible (and probably quite common) that a T-1 today uses HDSL technology on twisted copper on one end of the circuit in the loop, fiber-optic electronics and medium in the interoffice transport, and traditional copper T-1 and electronics on the other end of the T-1 circuit.

that convert the electrical signals to optical ones, the fiber that carries the traffic to the central office, the electronics that convert the optical signals to electrical digital ones, and the electronics that directly integrate the electrical digital signals into the digital switching system. 31/

Customers served by DLCs thus do not have a dedicated copper link between their premises and the central office that serves them. Clearly it would be inaccurate to claim that there is no local loop associated with such customers. Indeed, the FCC has required ILECs to provide competitors with access to these loops on an unbundled basis. 32/

Over the years, the economics associated with DLC electronics, fiber optics, and copper plant have led ILECs to increase expenditures on the fiber-fed DLC service delivery method. In fact, this method is the primary outside plant relief and network growth vehicle used by all ILECs. The increasing deployment of remote DLC technology shows how inappropriate it would be to define the loop without regard to the electronics and other technology that enables the loop to perform at the level designed for it by the ILECs. 33/

31/ See Appendix C for an illustration of xDSL technology deployed in a DLC environment, and Appendix D for a more detailed discussion of the technology.

32/ Local Competition Order at paras. 383-84.

33/ Another example of the broad scope of the definition of a loop is the use of by ILECs of copper facilities to transmit concentrated digital (as opposed to conventional analog) signals to central offices. ILECs have deployed both traditional copper T-1s and the newer HDSL T-1 technologies to carry such traffic for many years.

In sum, the local loop cannot be defined by a particular type of medium or a particular set of electronics. The loop is simply a mechanism to carry traffic from a customer's premises to the central office.

IV. COMPETITORS CANNOT COST-JUSTIFY PROVIDING THEIR OWN XDSL ELECTRONICS AND INTEROFFICE FACILITIES ON A BROAD BASIS.

A. Competitors Will Not Have the Volumes Necessary to Justify Broad Deployment of xDSL Equipment.

To ensure the maximum development of competitive xDSL services and to ensure consumer choice and price competition for broadband services, it is essential that xDSL facilities, equipment, and functionality be available as network elements.

It is ironic that the RBOCs in their Section 706 petitions make such a passionate case for needing extra incentives to make the enormous capital expenditures and risk involved in investing in advanced technology. 34/ In doing so, they totally ignore the plight of the CLECs, who today possess tiny shares of the local market. Even if CLECs were to grow quickly, they cannot hope to have the volumes to justify the kind of local network investment that the RBOCs are contemplating.

US West's own statistics prove this out. US West argued in its Section 706 petition that because it serves many less densely populated areas, and thus has

34/ We discuss in Section VII below the major xDSL rollouts by the RBOCs and GTE, which belies their claim to need extra incentives.

lower volumes of customers per switch, it needs special incentives to invest in xDSL technology to serve those customers. 35/ Clearly, if it is hard for US West to justify investing in adding xDSL for each central office serving area (when it does not even need to collocate and is not restricted in the use of switches and routers as a CLEC is), and when it has the entire local customer base over which to spread the cost of that technology, imagine how difficult it would be for each of US West's competitors to justify that investment. As US West stated in its FCC petition:

> [D]eploying xDSL to a central office requires enormous capital investments: US West must install one or more DSLAMs in each central office, prepare the loops of each MegaBit Service subscriber, and cable the office to a network of ATM switching systems. 36/

US West also observes that

> The central office equipment used to provide MegaBit service is expensive: a basic, 128-user DSLAM costs approximately $73,000 installed (and several might be necessary), an installed ATM switching system costs approximately $350,000, and the DS-3 networking needed to connect the central office with other central offices can cost several hundred thousand dollars. . . . 37/

35/ Petition of US West Communications, Inc. for Relief from Barriers to Deployment of Advanced Telecommunications Services, FCC Docket No. 98-26, filed February 25, 1998 ("US West Petition") at 25-26.

36/ US West Petition at 35.

37/ *Id.* at 31-32. Based on conversations with vendors LCI believes the costs cited here to be low. The costs cited in footnote 40 below are more in line with current market conditions.

US West also correctly identifies residential and small business customers as the most vulnerable to being left out because of the relatively higher cost of serving them. 38/ With all this, it is genuinely puzzling why an RBOC would not conclude that the best way to recover this investment in xDSL equipment is to make it available to *all* carriers, thus maximizing volume.

The cost of a DSLAM, 39/ while significant, is only one of the costs facing competitors seeking to provide competitive xDSL-based services. 40/ The additional costs of collocation and installation of xDSL electronics and the cost of dedicated interoffice packet transport 41/ will inevitably skew CLEC provision of

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38/ *Id.* at 26.

39/ A DSLAM (Digital Subscriber Line Access Multiplexer) is the electronics attached to the central office end of a home run copper pair that enables it to have xDSL capability. See Appendix D at 3.

40/ The cost of the DSLAM (including the necessary remote testing capability) is approximately $100,000 for a 100-line DSLAM, with the per-line cost falling to about $800-900 per line with higher volumes. (In its Petition at 31-32, US West has cited lower figures of approximately $73,000 per DSLAM, but LCI's recent discussions with several vendors indicate that $100,000 is a more realistic figure.) The ILEC is much more likely to have the volumes necessary to justify installing this equipment in every central office. A carrier the size of LCI is unlikely to have this volume of customers in every central office, at least not at the market entry point. The ILEC, in contrast, could easily reach such a volume within a short period of time. Thus, even if the cost of the DSLAM equipment appears to be comparable for the ILEC and a CLEC, the ILEC as a practical matter, would have a cost advantage in most central offices. This comparison also fails to consider the many other costs that CLECs must incur that the ILEC either need not incur, or will incur on a much lower level due to its economies of scale.

41/ According to US West, the cost of the DS-3 networking needed for dedicated interoffice transport can be as much as "several hundred thousand dollars" per central office, depending on its location. US West Petition at 32.

xDSL services towards central offices serving dense commercial districts. The volume and density considerations that would drive a competitor to focus on a limited number of central offices are the same considerations that have driven the targeted nature of CLEC investment in competitive telecommunications facilities to date. Large revenue streams and high number of xDSL subscriber lines would be necessary to recoup the costs of collocation (regardless of the type), switching and transport, and other duplicative costs and expenses that would be unnecessary if xDSL-equipped loops, switching and transport could be obtained as network elements.

B. The Initial Costs of Installing and Maintaining xDSL Facilities Will Be Prohibitive in Most Cases.

1. Costs of Collocation

Most ILECs today would require a requesting carrier to physically collocate a DSLAM in each central office in order to provide competitive xDSL-based services, rather than permitting requesting carriers to obtain the loop already equipped with xDSL electronics as a network element. As a practical matter, any collocation requirement (whether physical, virtual, cageless, or otherwise) raises competitors' costs well beyond the level that the ILEC will incur, on a per-customer basis, to provide the same service. Collocation requirements of any kind thus could have the practical effect of eliminating an entire class of customers -- those for whom duplicate CLEC investment cannot be justified -- from enjoying the benefits of competitive and innovative choices in broadband telecommunications services.

2. Physical Collocation Costs

Central office space availability is a problem in many locations today, and may become a more widespread problem in the future as local competition takes hold. Where space is unavailable, requiring physical collocation means that customers served by such end offices will not enjoy the benefits of competitive broadband services. At least one CLEC has reported that in as many as 15% to 20% of central offices where it desired to physically collocate for the purpose of providing xDSL services, ILECs have claimed that no space was available. 42/ This was apparently the case even in central offices that primarily served residential customers.

Even where central office space is not a problem, requiring collocation and installation of DSLAM equipment is anticompetitive because it raises rivals' costs without any countervailing efficiency benefits. Collocation requirements also have the practical effect of forcing competitors to target only the most dense central offices, because competitors must be able to spread the added costs of collocation (which the ILECs do not incur) over a sufficiently large number of customers to make it profitable to compete against the ILEC's xDSL offerings. By forcing competitors to install their own DSLAM equipment (and thus to incur the costs of

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42/ See Comments of Covad on RBOC Section 706 petitions, FCC Docket Nos. 98-11, 98-26, 98-32, filed April 6, 1998, at 14. See also Comments of AT&T on Bell Atlantic Section 706 Petition, filed April 6, 1998, at 18 n.34.

collocation), ILECs can drive competitors' costs up to the point where it is not possible to compete for customers in many central offices (if at all).

For illustrative purposes, consider the consequences of a collocation requirement in one of the Texas LATAs (Dallas/Fort Worth). SBC in Texas has required competitors to install a minimum of a 100 square foot collocation cage. 43/ This requirement is, of course, patently absurd in light of the fact that the equipment is no bigger than a desktop computer without a monitor, but it is typical of many ILECs. Assuming an average cost for such physical collocation of about $100,000 in non-recurring charges 44/ and approximately $1500 in monthly recurring charges, and amortizing the non-recurring charges over ten years (a reasonable period of time over which a competitor could expect to recoup its non-recurring costs), the cost of such collocation would be roughly $2300 per month. Even if all other network elements are priced at TELRIC rates, a CLEC therefore will face a severe cost disadvantage vis-a-vis the ILEC in the provision of xDSL

43/ See Southwestern Bell Telephone Company, Physical Collocation Tariff, Section 7 (as revised on 3/9/98).

44/ This figure is a fairly typical ILEC non-recurring charge for a 100 square foot collocation space. See, e.g., Comments of Covad Communications Company on RBOC Section 706 petitions, filed April 6, 1998, at 15 ("Comments of Covad on RBOC Petitions"). Southwestern Bell has recently amended its collocation tariffs to reflect lower rates prescribed by the Texas PUC in arbitration proceedings, so it is not clear whether the average collocation charges would fall within the assumed range. But, as we discuss below, even if the assumed $100,000 collocation charge were significantly reduced (by a factor of ten) to $10,000, and the cage size were brought down from 100 to 7.5 square feet, the fact remains that many central offices would be unprofitable to serve via collocation.

services that is directly attributable to the collocation requirement. (As we discuss further below, this calculation does not include all the other costs that will be higher for a CLEC than they would be for the ILEC -- e.g., duplication of the interoffice network).

Assuming 80 per cent 45/ of all local loops in the Dallas-Fort Worth LATA are capable of supporting xDSL services and assuming a penetration rate of 0.5 percent (equivalent to one third of LCI's 1.5 percent nationwide long distance market share), a CLEC that wants to provide xDSL services will face a cost disadvantage attributable solely to its need to collocate ranging from $5.50 per line (per month) in the central office with the greatest concentration of lines to $1444 per line (per month) in the central office with the fewest lines. 46/ Put differently, depending on the central office, it would cost the CLEC between $5.50 per line and $1444 per line more than it would cost the ILEC to provide xDSL services due solely to the collocation requirement.

Using this example, and assuming that a CLEC somehow could profitably serve customers in central offices in which its costs were $10 per month per line more than the ILEC's (which is unlikely to be possible, given that the price

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45/ This assumption is actually on the high side. In reality, fewer than 80 percent of the loops are likely to be capable of supporting xDSL services, and therefore the number of potential customers in each central office will be even lower.

46/ The source for the number of lines per central office is the 1995 ARMIS data on switched access lines.

of current xDSL offerings range anywhere from $40 to $150 per line per month), a CLEC could profitably offer xDSL services only in five of the 112 central offices in the Dallas-Fort Worth LATA. This leaves customers in 107 central offices who would not be offered competing xDSL services by CLECs. If one were to assume that a CLEC could only absorb a $5 per line (per month) cost differential vis-vis the ILEC (a more reasonable, though still probably unrealistic, assumption) a CLEC could not profitably offer the service in *any* of the 112 central offices. That is so because, based on our calculations, there is no central office where the cost differential between the CLEC and the ILEC is as low as $5.00. 47/

Even if the non-recurring cost of physical collocation were reduced by many factors to a more reasonable level (such as the $10,000 for cageless collocation proposed by Covad) 48/ and the minimum space requirement were only 7.5 square feet (for example, as agreed to by BellSouth in the Tennessee Section 271 proceedings), 49/ 48 central offices in the Dallas-Fort Worth area (almost half of the

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47/ The point here is that because the CLEC must incur substantial up-front costs in connection with collocation, it must spread those costs among its customers in each central office. The CLEC will always have a cost disadvantage vis-a-vis the ILEC because of its need to incur collocation costs. Even if one assumes that the CLEC can absorb some of this cost differential (through lower overhead or customer acquisition costs, for example), it still will not be able to cost-justify serving customers in less dense central offices.

48/ Comments of Covad on RBOC Petitions at 15.

49/ Here we prorate the assumed $1500 monthly recurring charge, based on the smaller cage size ($15 per square foot).

total) would not qualify as profitable, assuming that the CLEC could absorb a cost differential vis-a-vis the ILEC of $5 per line per month.

Of course, any cost differential is discriminatory and anticompetitive. CLECs could absorb such a differential only if their other expenses (e.g. marketing overhead) could be reduced below the level incurred by the ILEC. More important, however, the figures just discussed do not include the CLECs' likely much higher transport and switching expenses and higher per line installation, maintenance and testing, engineering, and other costs. These additional higher per-customer costs are discussed below. Thus, under even the highly optimistic (and unrealistic) scenario presented above, many central offices would be unprofitable to serve if the entrant were forced to install its own xDSL facilities.

3. Virtual, "Cageless," and Other Types of Collocation

Some ILECs have made available or have proposed virtual collocation options or variations on physical collocation (such as "cageless collocation"), which are designed to deal with the high costs of physical collocation and the space limitations in central offices that could prevent physical collocation. 50/

Such alternatives are no solution. They entail economic obstacles in the form of real and hidden costs when implemented in the real world. For instance, virtual collocation requires the CLEC to gain ILEC approval for the type

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50/ See, e.g., Pre-Filing Statement of Bell Atlantic-New York, Petition of New York Telephone Company for Approval of its Statement of Generally Available Terms and Conditions Pursuant to Section 252 and Draft Filing of Petition for InterLATA Entry, NY PSC Case No. 97-C-0271, filed April 6, 1998, at 16.

and size of the equipment placed. In addition, ILECs charge prices they set unilaterally for the maintenance of equipment. ILECs also typically mandate that the equipment be fully provisioned, thereby excluding the prudent business practice of deploying assets incrementally.

Virtual collocation also, by definition, adds unnecessary costs that would not need to be incurred if a CLEC could obtain xDSL-equipped loops as network elements. Virtual collocation and other methods also are either subject to dispute or are not yet developed or tested. ILECs generally have been reluctant to explore alternatives to physical collocation until forced to do so by regulators. The CLEC and ILEC industries have spent the last two years engaged in seemingly endless legal fights over the details of these issues in interconnection arbitration proceedings that continue to this date on a state-by-state basis.

Finally, with virtual, cageless, or physical collocation, a CLEC still cannot serve on a parity basis the significant and growing number of customers who are served by the ILECs using DLCs (approximately 20-30 percent of all subscriber lines nationwide, and growing). The issues surrounding competitor access to DLC loops (whether or not equipped with xDSL capability) have yet to be resolved. 51/

51/ ILEC interconnection agreements continue to put the CLEC at a competitive disadvantage when it comes to obtaining loops equipped with DLC electronics. ILECs generally provide unbundled local loops served on DLCs only after passing special construction costs and time delays onto the CLEC. These charges are either for construction of new "home run" copper plant placed by the ILEC or for reverse DLC equipment (required to de-multiplex back to the copper analog signal level) located in the Central office. All these details add unnecessary costs and delay for the CLEC.

4. Interoffice Switching and Transport Costs

Regardless of the type of collocation required for the DSLAM, access to transport from the central office to a CLEC's data switching systems is still necessary. CLECs must have the option of employing the ILEC's interoffice transport and switching to carry the xDSL traffic of their customers to their own networks, just as they do for carrying conventional local exchange traffic. Without such an option, a CLEC would be forced to build duplicate interoffice transport and switching facilities from every central office that would be cost-prohibitive, at least until the CLEC has a large, established base of customers served by broadband facilities at each central office. 52/

The cost of duplicating the ILECs' interoffice network -- to bring broadband traffic from each central office to the CLEC's packet switch -- would be prohibitive. 53/ As the FCC recognized in ordering ILECs to provide network element access to the ILEC interoffice transport network ("shared transport"),the volume efficiencies of the ILEC network are enormous. Lack of access by competitors to that shared interoffice network would pose a significant barrier to entry, as the FCC found. 54/ Similarly, if competitors had to duplicate the ILEC

52/ CLECs that target only a handful of central offices for xDSL service might find it economic to provide their own dedicated interoffice transport, but to serve all central offices (and thus all potential customers), the cost of such transport would be prohibitive.

53/ See US West Petition at 23 and 31-32 (regarding costs for backhauling data traffic).

54/ See Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, CC Docket No. 96-98, 95-185, Third Order on interoffice packet network in order to provide competing broadband telecommunications services to all central offices, the costs would be prohibitive. 55/

Because of the broadband capabilities of xDSL loops, dedicated interoffice transport to carry such traffic has become increasingly expensive (for example, $2,000 per month for a DS-3 circuit of 5 miles in the BellSouth region). 56/ As a result, a CLEC is unlikely to offer xDSL services to customers served by central offices with few potential subscribers (e.g., central offices serving small business and residential customers and central offices in less densely populated areas). 57/ Only the ILEC, which already has an interoffice network, could justify serving all those locations.

Reconsideration, FCC 97-295, released August 18, 1997, 12 FCC Rcd 12460, petitions for review pending, Southwestern Bell Tel. Co. v. FCC, Nos. 97-3389 et al. (8th Cir.), at paras. 25-37. The FCC recognized that if competitors had to duplicate the ILEC interoffice network (even through use of unbundled dedicated interoffice transport), the costs of such duplication would be enormous: "[T]he failure of the incumbent LEC to provide access to all of its interoffice transport facilities on a shared basis would significantly increase the requesting carriers' costs of providing local exchange service and thus reduce competitive entry in the local exchange market." Id. at para. 34.

55/ Requesting carriers also would require access to the ILEC's packet switches, just as they require network element access to the ILEC circuit switches. Switching, router, and interoffice transport, whether circuit-switched or packet-switched, clearly fall within the definition of network elements under the Act. 47 U.S.C. § 153(29). DSLAMs also are now being made with packet switching capability built in.

56/ The bandwidth required for interoffice transport for xDSL services would start at the DS-3 or OC-N level.

57/ In those circumstances in which placing a DSLAM in a central office can be cost-justified, prohibitions on placing equipment with switching functionality in collocation cages prevent efficient network design and optimization.